# 10.3.2 User Newsletter

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This is the fourth user newsletter for Beamline 10.3.2 Since the last newsletter, we've had several groups of users taking real data on a variety of systems. It may fairly be said that the line is now in full operation and has been so since December. Papers are being written. However, the April shutdown has come, so we're back in building and upgrade mode.

**Optics**

The mono upgrade plan is proceeding. The design is done and the parts are being made. A new development is that there is now a commercial system for controlling Picomotors using LVDTs for feedback. This makes it possible to control them by computer as one would any servo. The availability of this device is key to the new mono as the crystal translation needs to be computer controlled in order to keep the exit height fixed. The aim is to test and debug the system off-line, then install it.

Beamline 11.3.1 has implemented a system in which a video camera looks at the beam on a phosphor and the computer automatically tunes the mirror (mirrors, for us) to get the smallest spot. We now have a cadmium tungstate crystal phosphor which will allow us to resolve the beam size, but we need to build the video microscope with which to look at it. The aforementioned Picomotor-servo system will be used to control the mirrors.

We had had problems with the M2 (vertical collimating) mirror degrading and the pre-mirror slits not working well. It turned out that the slits had been greased with

something which wasn't really vacuum-compatible. These slits are right upstream of M2, so they bled hydrocarbons all over the surface. We cleaned the slits and lubed the mechanism with a tiny amount of Torr-Lube, which seems to have fixed much of the problem. We have a spare for M2, which unfortunately was coated only with Pt and not Rh over Pt. We are having it recoated now so we can use it in place of the current, tracked-up M2. Also, we have cleaned the roll slits, which had macroscopic amounts of carbonaceous crud on them. This deposit explains why the slits became effectively narrower at lower energies.

The current I0 monitor consists of a couple of copper paddles hung from the ends of cables, dangling between the sample and exit window of the optics box. We will replace this with a new, enclosed ion chamber. The channeltron housing will be removed to make room.

**Beam motion**

When the beam comes back after the shutdown, it won't be in the same place as it was before. This is because the machine physics group is taking the opportunity to do a realignment. Over the years, motions of the earth and the structure of the ring have taken the orbit farther and farther from the original 'golden' orbit. It has been decided that it's time to reset. Therefore, a couple of days will be made available to us to see how much the change is. If it's a lot, we may have to move our M1 mirror and maybe the components in the end station. This might cause some loss of time for the first scheduled user after the shutdown, but I hope it won't.

**Software**

The XY mapping routine now includes two new analysis screens: correlation and scatterplot. The former shows the normalized cross-correlation between any two elements, enabling one to detect association or segregation. The scatterplot screen plots the counts from one element vs. those from another, with each pixel contributing a point to the plot. This plot can show the existence of two or more different kinds of material, characterized by different relationships between element concentrations.

The EXAFS analysis suite now includes background removal and reduction to k-space, FT, linear fit (with $E_0$ shift) and PCA with target testing. There is also a program to read the spectrum files produced by the MCA utility. We also have WinXAS2.1. The background-removal program includes a novel tool for assessing how much of the EXAFS signal gets 'eaten' by the spline fit background removal step. In addition to the specialized EXAFS programs, I have also written programs to plot, edit and do arithmetic on two-column (XY) data files. Still to come (Real Soon Now) is a non-linear least-squares fit program for EXAFS filtered data. Executable versions of some of the analysis programs are now available.

The EXAFS data-taking program is now aware of the stage and records the stage position in the data file headers. In addition, it has the ability to move from point to point on the sample, taking scans as it goes. Thus, you can program it to take 3 scans at point A, 4 at B, 2 at C and repeat.

**Ease of use and miscellaneous issues**

I am ashamed to report that I haven't written any of the manuals I promised in the last newsletter. However, I have written a couple more cheat-sheets, including one on common error conditions and how to clear them.

We now have a polarizing microscope on the bench, with encoders on the stage, for looking at samples before scanning them.

Bob Sublett (associate beamline scientist) is working on the web page. Whatever manuals there are will be linked there so you'll be able to read all about the line at home. Also, he's going to be trained with actual beam time in July, after which he will be able to be of more assistance to users and to write manuals from a user perspective.

**Diffraction**

We now have the CCD detector which used to be on 7.3.3 along with the computer which went with it. We're doing some mechanical work needed to install it in the beamline, and then we need to do some work to upgrade the computer it came with. We also have to replace a drive board in the motion controller with which we will move the detector. We hope to have it ready to go after the April shutdown.